

ATTORNEY DOCKET NO. 07121.0003U1
Application No. 09/990,874

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1. (currently amended) A modified xylanase comprising ~~at least one~~ or more than one substituted amino acid residue ~~at a position~~ selected from the group consisting of an acidic amino acid at position 11, a non-polar amino acid at position 116, a Cys at position 118, a first basic amino acid at position 144, and a second basic amino acid at position 161, said position determined from sequence alignment of said modified xylanase with *Trichoderma reesei* xylanase II amino acid sequence defined in SEQ ID NO:16.
2. (currently amended) The modified xylanase of claim 1, wherein the modified xylanase exhibits improved thermophilicity, alkalophilicity, expression efficiency, or a combination thereof, in comparison to a corresponding native xylanase.
3. (canceled)
4. (currently amended) The modified xylanase of claim ~~3, 1~~ wherein ~~said at least one~~ substituted the first basic amino acid at position 144 is selected from a group consisting of Arg and Lys.
5. (currently amended) The modified xylanase of claim 4, wherein ~~said~~ the modified xylanase is derived from a Family 11 xylanase.

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6. (currently amended) The modified xylanase of claim 5, wherein ~~said~~ the Family 11 xylanase is a *Trichoderma reesei* xylanase.

7. (currently amended) The modified xylanase of claim 4, further comprising a His at positions 10 and 105, Met at position 27, Leu at position 29, Ala at positions 75 and 125, and Glu at position 129 (~~HML-AHAE~~).

8. (canceled)

9. (currently amended) The modified xylanase of claim ~~8~~, 1 wherein ~~said at least one substituted amino acid~~ the second basic amino acid is selected from a group consisting of Arg, Lys and His.

10. (currently amended) The modified xylanase of claim 9, wherein ~~said~~ the modified xylanase is derived from a Family 11 xylanase.

11. (currently amended) The modified xylanase of claim 10, wherein ~~said~~ the Family 11 xylanase is a *Trichoderma reesei* xylanase.

12. (original) The modified xylanase of claim 9, further comprising a His at positions 10 and 105, Met at position 27, Leu at position 29, Ala at positions 75 and 125, and Glu at position 129.

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13. (currently amended) The modified xylanase of claim 12, further comprising a ~~second~~ substituted first basic amino acid at position 144 ~~and is selected from the group consisting of~~ basic amino acids.
14. (currently amended) The modified xylanase of claim 13, wherein ~~said second substituted~~ the first basic amino acid is selected from a group consisting of Arg and Lys.
15. (currently amended) The modified xylanase of claim 14, wherein said the modified xylanase is derived from a Family 11 xylanase.
16. (currently amended) The modified xylanase of claim 15, wherein ~~said the~~ the Family 11 xylanase is a *Trichoderma reesei* xylanase.
17. (canceled)
18. (currently amended) The modified xylanase of claim ~~17, 1~~ wherein ~~said at least one~~ substituted the acidic amino acid is Asp.
19. (currently amended) The modified xylanase of claim ~~18~~, wherein ~~said the~~ the modified xylanase is derived from a Family 11 xylanase.

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20. (currently amended) The modified xylanase of claim 19, wherein ~~said~~ the Family 11 xylanase is a *Trichoderma reesei* xylanase.

21. (original) The modified xylanase of claim 18, further comprising a His at positions 10 and 105, Met at position 27, Leu at position 29, Ala at positions 75 and 125, and Glu at position 129.

22. (currently amended) The modified xylanase of claim 21, further comprising ~~a second and a third substituted~~ the first basic amino acid at position 144 and the second basic amino acid at position 161, ~~and is selected from the group consisting of basic amino acids.~~

23. (currently amended) The modified xylanase of claim 22, wherein ~~said second substituted~~ the first basic amino acid at position 144 is selected from a group consisting of Arg and Lys, and ~~said third substituted~~ the second basic amino acid at position 161 is selected from a group consisting of Arg, Lys and His.

24. (currently amended) The modified xylanase of claim 23, wherein ~~said~~ the modified xylanase is derived from a Family 11 xylanase.

25. (currently amended) The modified xylanase of claim 24, wherein ~~said~~ the Family 11 xylanase is a *Trichoderma reesei* xylanase.

26. (canceled)

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27. (currently amended) The modified xylanase of claim 26, ~~1~~ wherein ~~said at least one~~
~~substituted~~ the non-polar amino acid is Gly.

28. (currently amended) The modified xylanase of claim 27, wherein ~~said~~ the modified xylanase
is derived from a Family 11 xylanase.

29. (currently amended) The modified xylanase of claim 28, wherein ~~said~~ the Family 11
xylanase is a *Trichoderma reesei* xylanase.

30. (original) The modified xylanase of claim 27, further comprising a His at positions 10 and
105, Met at position 27, Leu at position 29, Ala at positions 75 and 125, and Glu at position 129.

31. (currently amended) The modified xylanase of claim 30, further comprising a ~~second~~
~~substituted~~ the acidic amino acid at position 11 ~~and is selected from the group consisting of~~
~~acidic amino acids, a third and fourth substituted~~ the first basic amino acids acid at positions
position 144 and the second basic amino acid at position 161, ~~and are selected from the group~~
~~consisting of basic amino acids.~~

32. (currently amended) The modified xylanase of claim 31, wherein ~~said second substituted~~ the
acidic amino acid at position 11 is Asp, ~~said third substituted~~ the first basic amino acid at

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position 144 is selected from a group consisting of Arg and Lys, and ~~a fourth substituted~~ the
second basic amino acid at position 161 is selected from a group consisting of Arg, Lys and His.

33. (currently amended) The modified xylanase of claim 32, wherein ~~said~~ the modified xylanase
is derived from a Family 11 xylanase.

34. (currently amended) The modified xylanase of claim 33, wherein ~~said~~ the Family 11
xylanase is a *Trichoderma reesei* xylanase.

35-36. (canceled)

37. (currently amended) The modified xylanase of claim ~~36~~ 1, wherein ~~said~~ the modified
xylanase comprises a Cys at position 118 and is derived from a Family 11 xylanase.

38. (currently amended) The modified xylanase of claim 37, wherein ~~said~~ the Family 11
xylanase is a *Trichoderma reesei* xylanase.

39. (currently amended) The modified xylanase of claim ~~36~~ 37, further comprising a His at
positions 10 and 105, Met at position 27, Leu at position 29, Ala at positions 75 and 125, and
Glu at position 129.

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40. (currently amended) The modified xylanase of claim 39, further comprising a ~~second~~ substituted the acidic amino acid at position 11 and ~~is selected from the group consisting of acidic amino acids, a third and fourth substituted the first basic amino acids acid at positions~~ position 144 and the second basic amino acid at position 161, and ~~are selected from the group consisting of basic amino acids.~~

41. (currently amended) The modified xylanase of claim 40, wherein ~~said second substituted the~~ acidic amino acid at position 11 is Asp, ~~said third substituted the first basic~~ amino acid at position 144 is selected from a group consisting of Arg and Lys, and ~~a fourth substituted the~~ second basic amino acid at position 161 is selected from a group consisting of Arg, Lys and His.

42. (currently amended) The modified xylanase of claim 41, wherein ~~said the~~ modified xylanase is derived from a Family 11 xylanase.

43. (currently amended) The modified xylanase of claim 42, wherein ~~said the~~ Family 11 xylanase is a *Trichoderma reesei* xylanase.

44. (currently amended) The modified xylanase of claim 40, wherein ~~said second substituted the~~ acidic amino acid at position 11 is Asp, ~~said third substituted the non-polar~~ amino acid at position 116 is Gly, ~~said fourth substituted the first basic~~ amino acid at position 144 is selected from a group consisting of Arg and Lys, and ~~a fifth substituted the second basic~~ amino acid at position 161 is selected from a group consisting of Arg, Lys and His.

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45. (currently amended) The modified xylanase of claim 44, wherein ~~said~~ the modified xylanase is derived from a Family 11 xylanase.

46. (currently amended) The modified xylanase of claim 45, wherein ~~said~~ the Family 11 xylanase is a *Trichoderma reesei* xylanase.

47. (canceled)

48. (currently amended) A ~~use of method of manufacturing pulp, comprising treating the pulp~~ with the modified xylanase in of claim 1 in an industrial process.

49. (currently amended) A modified xylanase comprising the sequence of ~~selected from the group (as described in Table 2) consisting of:~~

~~TrX-HML-75A105H-125A129E-144R~~

~~TrX-HML-75A105H-125A129E-144R-161R~~

~~TrX-116G~~

~~TrX-118G~~

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~~TrX-HML-75A105H-116G-125A129E-144R~~

~~TrX-HML-75A105H-118C-125A129E-144R~~

~~TrX-H-11D-ML-75A105H-125A129E-144R161R~~

~~TrX-H-11D-ML-75A105H-116G-125A129E-144R161R~~

TrX-H-11D-ML-75A105H-118C-125A129E-144R161R (SEQ ID NO:55).

~~TrX-H-11D-ML-75A105H-116G-118C-125A129E-144R161R~~

50-55. (canceled)

56. (currently amended) The xylanase of claim 55 4, wherein said the basic amino acid is Arg.

57. (currently amended) A The modified xylanase of claim 1 comprising an the acidic amino acid at position 11, a the non-polar amino acid at position 116, and a the basic amino acid at position 144, ~~said position determined from sequence alignment of said modified xylanase with *Trichoderma reesei* xylanase II amino acid sequence defined in SEQ ID NO:16.~~

58. (currently amended) The xylanase of claim 57, wherein said the acidic amino acid is Asp, said the non-polar amino acid is Gly, and said the basic amino acid is Arg.

59. (currently amended) A The modified xylanase of claim 1 comprising an the acidic amino acid at position 11, a ~~non-aromatic hydrophobic amino acid~~ Cys at position 118, and a the first basic amino acid at position at position 144, ~~said position determined from sequence alignment~~

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~~of said modified xylanase with *Trichoderma reesei* xylanase II amino acid sequence defined in SEQ ID NO:16.~~

60. (currently amended) The xylanase of claim 59, wherein ~~said~~ the acidic amino acid is Asp, ~~said~~ the non-aromatic hydrophobic amino acid is Cys, and ~~said~~ the basic amino acid is Arg.

61. (currently amended) A The modified xylanase of claim 1 ~~comprising at least one substituted amino acid residue, wherein said modified xylanase is characterized as having a maximum effective temperature (MET) between about 69°C to about 84°C, and wherein said~~ the modified xylanase is a Family 11 xylanase obtained from a *Trichoderma* sp..

62. (currently amended) The modified xylanase of claim 61, wherein ~~said~~ the MET is between about 70° to about 84°C

63. (currently amended) A The modified xylanase of claim 1 ~~comprising at least one substituted amino acid residue, wherein said modified xylanase is characterized as having a maximum effective pH (MEP) between about pH 5.8 to about pH 8.4, and wherein said~~ the modified xylanase is a Family 11 xylanase obtained from a *Trichoderma* sp..

64. (currently amended) The modified xylanase of claim 63, wherein ~~said~~ the MEP is between about pH 6.0 to about pH 8.0

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65. (currently amended) The modified xylanase of claim 61, wherein ~~said~~ the modified xylanase is further characterized as having a maximum effective pH (MEP) is between about pH 5.8 to about pH 7.6.

66. (currently amended) The modified xylanase of claim 62, wherein ~~said~~ the modified xylanase is further characterized as having a maximum effective pH (MEP) is between about pH 6.5 to about pH 7.4.

67. (new) The modified xylanase of claim 1, wherein the first basic amino acid at position 144 is Arg, the second basic amino acid at position 161 is Arg, or both the first amino acid at position 144 and the second basic amino acid at position 161 are Arg.

68. (new) The modified xylanase of claim 1 comprising the acidic amino acid at position 11, the first basic amino acid at position 144, and the second basic amino acid at position 161.

69. (new) The modified xylanase of claim 68, wherein the acidic amino acid is Asp, the first basic amino acid is Arg and the second basic amino acid is Arg.

70. (new) The modified xylanase of claim 1 comprising the acidic amino acid at position 11, the non-polar amino acid at position 116, the first basic amino acid at position 144, and the second basic amino acid at position 161.

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71. (new) The modified xylanase of claim 1, wherein the acidic amino acid is Asp, the non-polar amino acid is Gly, the first basic amino acid is Arg and the second basic amino acid is Arg.